

move toward 1.0 over time, many financial services, such as *Value Line* and Merrill Lynch, adjust their original estimate of a company's beta by the formula:

$$\text{Adjusted beta} = .66(\text{Estimated beta}) + .34(1.0)$$

Applying the above formula to the Brattle Group's estimated beta of 1.82 produces an adjusted beta of 1.54.⁴ This adjusted beta is a more accurate estimate of the cable companies' beta for the next several years than the Brattle Group's 1.82 estimate. The use of a beta equal to 1.54 would have reduced the Brattle Group's estimate of the cable companies' cost of equity by 238 basis points.

10. The need to adjust estimated betas for their tendency to move toward the mean beta of 1.0 over time arises from the observation that the estimated beta is equal to the true beta plus a random error term with expectation zero:

$$\text{Estimated beta} = \text{True beta} + \text{Random error}$$

In an oft-quoted paper, Professor M. Blume of the University of Pennsylvania observes that an unusually high or low estimated beta is generally the result of an extreme error added to a somewhat more moderate true beta.⁵ Since the random error is expected to be zero in the next period, the estimated beta will tend to overstate the true beta.

⁴ $.66(1.82) + .34(1.0) = 1.54$. For further information on this adjustment, see William F. Sharpe and Gordon J. Alexander, 1990, *Investments* (4th ed.), Englewood Cliffs, NJ: Prentice Hall, pp. 427-428.

⁵ M. E. Blume, "Betas and Their Regression Tendencies", *The Journal of Finance*, June 1975, pp. 785-795.

11. Professor Blume's analysis fits the cable industry quite well over the five-year period the Brattle Group used to estimate their cable industry betas. During this period, the cable industry received a number of random shocks that were unrelated to movements in the general market. For instance, in the week the possible TCI—Bell Atlantic merger was announced, cable industry stock prices increased by 17.95 percent,⁶ while the S&P 500 went up by just 2 percent. The merger announcement should not have affected the cable companies' true beta because it was an industry-specific event that was unrelated to market movements.⁷ However, the merger announcement did have a dramatic impact on the measured beta, for the increase in cable industry stock prices was approximately 9 times the increase in the S&P 500 during that same week. Other industry-specific events, such as the reduction in cable rates announced April 1, 1993, and March 30, 1994, had a similar impact on the cable companies' estimated beta. These random shocks artificially raised the observed beta, but provide no guidance in estimating the true beta going forward. My studies indicate that the cable companies' estimated beta would decrease approximately 28 basis points, if only 4 weekly observations (out of more than 250), corresponding to specific events in the cable industry unrelated to general market movements, are deleted from the 5-year period studied by the Brattle Group.

⁶ As measured by a market weighted index of the cable stocks studied by the Brattle Group and available in Compustat.

⁷ In the language of the CAPM, the risk of industry specific events are "unsystematic" -- the risk that can be eliminated with a fully diversified portfolio. The investor will only be compensated for "systematic" risk -- the market risk that is present even after diversification.

B. The Brattle Group overstates the cable companies' cost of debt.

12. The Brattle Group uses the *current* S&P yield on long-term bonds of similar risk to the cable companies to estimate the cable companies' cost of debt. For the Brattle Group's cable companies, the current cost of long-term debt averaged 10 percent. The Brattle Group's use of the current cost of long-term debt is inconsistent with the Commission's practice of using the embedded cost of debt to calculate the telephone companies' average cost of capital.

13. Correcting the Brattle Group's estimate using the cable companies' *embedded* cost of debt lowers the overall rate of return. Specifically, the cable companies followed by the Brattle Group and available in Compustat have an average embedded cost of long-term debt of approximately 8.31 percent.⁸ The cable companies' average embedded cost of debt is less than the current S&P long-term bond yield for their rating category because cable companies have relied heavily on short- and intermediate-term debt to finance their operations, while the S&P bond yield pertains only to long-term debt. The Brattle Group's use of the current S&P yield on long-term bonds of similar rating, rather than the cable companies' average embedded cost of debt, clearly biases their estimate of the cable companies' average cost of capital upward.

⁸ See Schedule 1.

C. The Brattle Group understates the cable companies' leverage.

14. In calculating the weighted average cost of capital, the Brattle Group weights the cost of debt and the cost of equity by the market value percentage of debt and equity in the cable companies' average capital structure. The Brattle Group's use of market values, however, is inconsistent with the Commission's use of book values to measure both cable companies' and telephone companies' capital structures. Since the market value of the cable companies' equity exceeds the book value of their equity by a significant margin, the use of market values understates the cable companies' use of leverage as measured on a traditional basis. The use of understated leverage values produces an overstatement of the cable companies' average cost of capital.

IV. THE BRATTLE GROUP OVERSTATES THE CABLE COMPANIES' COST OF EQUITY AT A 50—50 CAPITAL STRUCTURE.

A. The Brattle Group incorrectly assumes that the cost of capital does not depend on the cable companies' capital structures.

15. Recognizing that their cost of equity estimate relates only to the cable companies' actual capital structures, the Brattle Group attempts to adjust their cost of equity so that it will relate to the Commission's proxy capital structure of 50 percent debt and 50 percent equity. In making their adjustment, however, the Brattle Group incorrectly assumes that the cable companies' average cost of capital for a 50—50 capital structure is identical to the cable companies' average cost of capital for their actual capital structures. The Brattle Group's basic assumption that the average cost of capital is

independent of capital structure is inconsistent with the conventional wisdom that the average cost of capital varies with a company's capital structure.

B. The Brattle Group incorrectly unlevers and relevers the cable companies' betas.

16. The correct method for obtaining the CAPM estimate of the cost of equity at a 50—50 capital structure is to: 1) use the relationship between beta and the percent debt in the capital structure to obtain an adjusted beta corresponding to a 50—50 capital structure, and 2) use the adjusted beta to obtain the cost of equity that corresponds to a 50—50 capital structure. The Brattle Group correctly reports the formulas for making the beta adjustment in their paper, but they do not implement these equations correctly.⁹ When the equations are implemented correctly, the adjusted beta for a 50—50 capital structure is equal to 1.17.¹⁰ Using a beta of 1.17, the

⁹ The Brattle Group errs by arbitrarily assuming a debt beta of .45 for cable companies. (See the Brattle Group report, Appendix B, page 14.) Since bondholders bear much less market risk over their typical holding period than do stockholders, it is standard practice for financial analysts to assume a debt beta of zero. This assumption is consistent with holding a bond to maturity.

¹⁰ According to the formulas shown on the Brattle Group's report, page 13 of Appendix B:

$$\beta_A = \beta_D \times \frac{D}{V} + \beta_E \times \frac{E}{V}$$

$$\beta_E^L = \beta_A \times (1 + \frac{\hat{D}}{E}) - \hat{\beta}_D \times \frac{\hat{D}}{E}$$

With a debt beta of zero, an equity beta of 1.54, and the capital structure used by the Brattle Group of 38 percent equity,

$$\beta_A = 1.54(.38) = .585$$

At the target 50-50 capital structure, $\beta_E^L = .585(1 + .5/.5) = 1.17$

Brattle Group would have obtained a cost of equity for a 50—50 capital structure of 13.7 percent.¹¹

- C. The cable companies' ECAPM¹² cost of equity is 15.35 percent for a capital structure with 50 percent debt and 50 percent equity.**

17. Since equity is a long-term investment, the yield on long-term Treasury bonds is a more appropriate estimate of the risk-free rate than the yield on short-term Treasury bills. In the Federal Reserve's June 7, 1994, *Statistical Release*, the yield on long-term Treasury bonds is reported as 7.27 percent. The Ibbotson Associates' *1994 Yearbook* reports a risk premium of 7.2 percent on equity compared to long-term Treasury bonds. Using a risk-free rate of 7.27 percent, a beta of 1.17, and a risk premium of 7.2 percent in the ECAPM produces a cost of equity estimate for a 50—50 capital structure equal to 15.35 percent.¹³

- D. Using the Brattle Group's own ECAPM calculation, the cable companies' average cost of capital with a 50—50 capital structure is 11.83 percent.**

18. Using a corrected version of the Brattle Group's own ECAPM calculation, the cable companies' average cost of capital is given by:

$$ACC = 8.31(.5) + 15.35(.5) = 11.83$$

¹¹ According to the CAPM formula, $3.74 + 1.17(8.5) = 13.7$

¹² The ECAPM is defined by the Brattle Group as an empirical version of the CAPM. The ECAPM includes an adjustment that seeks to take into account empirical investment realities such as personal taxes, transactions costs and dividends.

¹³ According to the Brattle Group's ECAPM formula, $(7.27 + 2) + 1.17(7.2 - 2) = 15.35$.

This 11.83 percent ECAPM estimate of the cable companies' average cost of capital differs from my original estimate of the cable companies' average cost of capital in this docket filed in August 1993 for three reasons. First, my original estimate was based on the cable companies' actual 1992 capital structure rather than a hypothetical 50—50 capital structure. Second, my original estimate was based on a slightly lower cost of debt. Third, my original estimate was based on a slightly lower DCF cost of equity.¹⁴

V. THE CABLE COMPANIES' AVERAGE COST OF CAPITAL USING THEIR ACTUAL AVERAGE CAPITAL STRUCTURE IS 9.38 PERCENT.

19. In previous testimony in this docket, I presented an estimate of the cable companies' average cost of capital using their *actual* book value capital structures, adjusted for their accumulated losses, and a DCF estimate of the mean cost of equity for the third quartile of the S&P 400. For all the reasons given in my previous testimony, I still believe this approach is appropriate for the cable industry. Updating my studies to reflect more recent data, I have determined that the cable companies' average cost of capital is now 9.38 percent. This estimate is based on a market weighted mean DCF cost of equity for the third quartile equal to 15.44 percent,¹⁵ an embedded

¹⁴ My cable companies' actual average 1992 capital structure contained 86 percent debt and 14 percent equity. The 1992 average embedded cost of debt for these companies was 7.80 percent. My original DCF estimate of the cable companies cost of equity was 15.11 percent.

¹⁵ See Schedule 2.

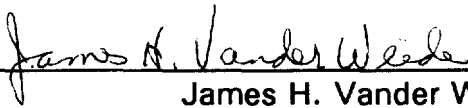
cost of debt of 8.31 percent, and a book value capital structure containing 84.93 percent debt and 15.07 percent equity.¹⁶

20. The Brattle Group misapplies an alternative methodology to calculate a cable industry cost of capital. The result is a recommendation that significantly overstates the industries' actual cost of capital. If accepted by the Commission, this recommendation, would provide the cable industry with an artificial advantage in their competition with the telephone industry.

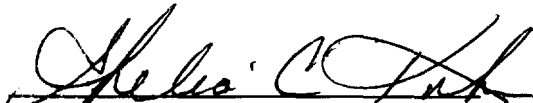
¹⁶ See Schedule 3.

AFFIDAVIT OF JAMES H. VANDER WEIDE

I, JAMES H. VANDER WEIDE, being duly sworn, depose and say
that the foregoing testimony and exhibits are true and correct to the best
of my knowledge and belief.


James H. Vander Weide

Subscribed and sworn to
before me this 29 day
of July 1994.


Notary Public

My Commission Expires Jan 14 1997

1993 COST OF DEBT

<u>Company Name</u> (\$ in millions)	<u>ST Debt</u>	<u>LT Debt*</u>	<u>Cap Leases</u>	<u>Int Expense</u>	<u>Embedded Cost of Debt</u>
Adelphia Commun -CL A	\$16.285	\$1,701.613	\$13.201	\$165.888	9.58%
Cablevision Systems -CL A	\$20.216	\$2,215.283	na	\$232.434	10.40%
Century Commun -CL A	\$20.072	\$1,167.423	\$0.000	\$112.294	9.46%
Comcast Corp -CL A	\$284.781	\$4,162.914	\$0.000	\$347.448	7.85%
Jones Intercable -LP -CL A	\$1.109	\$17.291	\$0.830	\$0.979	5.14%
Jones Intercable Inc. -CL A	\$46.000	\$279.986	\$1.228	\$43.573	13.32%
Jones Spacelink LTD -CL A	\$115.000	\$281.479	na	\$47.177	11.90%
TCA Cable TV Inc.	\$25.705	\$117.548	\$0.000	\$10.971	7.66%
Tele-Communications -CL A	\$996.000	\$8,904.000	\$0.000	\$731.000	7.38%
TOTAL	\$1,505.168	\$18,847.537	\$15.059	\$1,691.744	Wtd Avg. 8.31%

*Not including Capital Leases

Assumptions: Capitalized Leases were not reported separately for Cablevision Systems or Jones Spacelink Ltd. They were assumed to be zero. All data is on a calendar year basis.

Company	Price	Divid	IBES Mean Growth	DCF Qty Result		
1 HOME DEPOT INC	\$42.05	\$0.12	20.40	20.75%	Overall Mean	14.94%
2 BLOCKBUSTER ENTMT CORP	\$25.00	\$0.10	26.90	27.41%	Overall Med	14.81%
3 LOWE'S COS	\$33.43	\$0.16	23.10	23.72%	Overall Mkt	
4 OCCIDENTAL PETROLEUM CORP	\$17.33	\$1.00	14.30	21.40%	Wtd Mean	15.23%
5 USX-MARATHON GROUP	\$17.10	\$0.69	15.80	20.72%		
6 BRUNSWICK CORP	\$22.48	\$0.44	18.00	20.45%		
7 WAL-MART STORES	\$25.35	\$0.17	19.50	20.35%		
8 UST INC	\$25.13	\$1.12	14.90	20.17%		
9 PHILLIPS PETROLEUM CO	\$29.81	\$1.12	15.40	20.03%		
10 PEP BOYS-MANNY MOE & JACK	\$29.45	\$0.17	19.30	20.03%		
11 PENNZOIL CO	\$48.42	\$3.00	12.80	19.97%		
12 COCA-COLA CO	\$40.83	\$0.78	17.40	19.78%		
13 U S HEALTHCARE INC	\$40.46	\$0.53	18.00	19.64%		
14 MOTOROLA INC	\$48.37	\$0.28	18.80	19.53%		
15 GAP INC	\$45.63	\$0.48	18.10	19.41%		
16 INTEL CORP	\$64.13	\$0.20	18.80	19.29%		
17 NUOR CORP	\$81.92	\$0.18	18.80	19.28%		
18 WENDY'S INTERNATIONAL INC	\$17.30	\$0.24	17.80	19.21%		
19 AUTODESK INC	\$54.79	\$0.48	18.10	19.18%		
20 ENGELHARD CORP	\$27.21	\$0.44	17.00	19.00%		
21 DISNEY (WALT) COMPANY	\$42.84	\$0.30	18.00	18.87%		
22 BAKER-HUGHES INC	\$18.57	\$0.46	15.80	18.83%		
23 FLEETWOOD ENTERPRISES	\$20.88	\$0.50	15.70	18.83%		
24 PERKIN-ELMER CORP	\$30.90	\$0.68	15.90	18.81%		
25 PHILIP MORRIS COS INC	\$51.98	\$2.76	12.20	18.80%		
26 SCIENTIFIC-ATLANTA INC	\$31.31	\$0.12	18.10	18.58%		
27 COMCAST CORP -CL A SPL	\$17.58	\$0.08	17.70	18.35%		
28 PFIZER INC	\$88.04	\$1.68	14.40	18.35%		
29 WOOLWORTH CORP	\$16.54	\$1.16	9.90	18.24%		
30 TJX COMPANIES INC	\$25.35	\$0.56	15.50	18.21%		
31 SYSCO CORP	\$25.71	\$0.36	16.40	18.13%		
32 MALLINCKRODT GROUP INC	\$32.93	\$0.50	16.20	18.10%		
33 NEW YORK TIMES CO -CL A	\$26.48	\$0.88	15.50	18.08%		
34 SCHLUMBERGER LTD	\$54.90	\$1.20	15.40	18.08%		
35 BROWNING-FERRIS INDS	\$27.54	\$0.88	15.00	18.02%		
36 MCDERMOTT INTL INC	\$21.27	\$1.00	12.30	17.98%		
37 VAMX TECHNOLOGIES INC	\$25.17	\$0.80	14.80	17.81%		
38 UNITED INC	\$19.79	\$0.38	15.40	17.63%		
39 GILLETTE CO	\$64.85	\$1.00	15.70	17.58%		
40 ALCO STANDARD CORP	\$53.42	\$1.00	15.30	17.58%		
41 AMERICAN BARRICK RESOURCE CP	\$23.77	\$0.10	17.00	17.52%		
42 HALLIBURTON CO	\$30.25	\$1.00	13.50	17.50%		
43 PEPSCO INC	\$35.75	\$0.64	15.30	17.43%		
44 SPRINT CORP	\$36.00	\$1.00	14.00	17.37%		
45 BLACK & DECKER CORP	\$18.79	\$0.40	14.80	17.28%		
46 FOSTER WHEELER CORP	\$40.52	\$0.74	15.00	17.23%		
47 DOW CHEMICAL	\$83.48	\$2.80	12.30	17.22%		
48 HANCOCK GENERAL INC	\$33.79	\$0.80	15.00	17.18%		
49 SCHERING-PLUGH	\$59.71	\$2.04	13.00	17.12%		
50 CHARMING SHOPPES	\$11.15	\$0.08	16.10	17.08%		
51 JOISTENS INC	\$18.75	\$0.68	10.80	17.08%		
52 BURLINGTON RESOURCES INC	\$43.54	\$0.55	15.50	17.04%		
53 BAUSCH & LOMB INC	\$47.29	\$0.98	14.80	17.02%		
54 LOUISIANA LAND & EXPLORATION	\$38.08	\$1.00	13.90	17.00%		
55 MEDTRONIC INC	\$77.46	\$0.88	15.90	16.87%		
56 MATTEL INC	\$25.15	\$0.24	15.80	16.87%		
57 TEXAS INSTRUMENTS INC	\$76.50	\$0.72	15.80	16.85%		
58 INTL PAPER CO	\$87.02	\$1.88	13.90	16.84%		
59 CIRCUIT CITY STORES INC	\$18.58	\$0.08	16.40	16.50%		
60 CORNING INC	\$51.92	\$0.88	14.30	16.88%		
61 NEWELL COMPANIES	\$40.75	\$0.80	14.50	16.88%		
62 MORTON INTL INC	\$82.21	\$1.12	15.40	16.88%		
63 ALBERTSON'S INC	\$28.48	\$0.44	15.00	16.88%		
64 COLUMBIANA HLTOR -VTG	\$40.54	\$0.12	16.50	16.88%		
65 FALCO CORP	\$18.38	\$0.37	14.10	16.84%		
66 SERVICE CORP INTERNATIONAL	\$25.08	\$0.42	14.80	16.84%		
67 BARD (C.R.) INC	\$24.85	\$0.58	14.10	16.83%		
68 AMERADA HESS CORP	\$48.33	\$0.80	15.30	16.81%		
69 ASHLAND OIL INC	\$40.31	\$1.00	13.80	16.80%		
70 ABBOTT LABORATORIES	\$27.88	\$0.76	13.50	16.79%		
71 TIMES MIRROR COMPANY -SER A	\$31.78	\$1.08	12.70	16.79%		
72 OSHKOSH ENGINEERING INC -CL A	\$14.13	\$0.51	12.40	16.75%	4th Quartile	
73 UNION CAMP CORP	\$45.04	\$1.56	12.50	16.65%	Mean	16.35%
74 ATLANTIC RICH-FIELD CO	\$37.95	\$5.50	10.00	16.65%	Median	17.63%
75 COLGATE-PALMOLIVE CO	\$88.48	\$1.44	13.80	16.57%	Mkt Wtd Mean	18.89%
76 OUTBOARD MARINE CORP	\$21.83	\$0.40	14.30	16.54%		
77 U S SURGICAL CORP	\$18.08	\$0.08	16.00	16.54%		
78 SAFETY-KLEEN CORP	\$14.88	\$0.35	13.80	16.32%		
79 MORRISON KNUDSEN CORP	\$25.23	\$0.80	12.70	16.51%		
80 BLOOM H & R INC	\$43.63	\$1.12	13.40	16.50%		
81 UNOCAL CORP	\$26.98	\$0.80	12.90	16.47%		

Company	Price	Divd	IBES Mean Growth	DCF Qtrly Result	
82 FLUOR CORP	\$50.54	\$0.52	15.20	16.45%	
83 MANOR CARE INC	\$27.00	\$0.09	16.00	16.40%	
84 RUSSELL CORP	\$28.71	\$0.40	14.70	16.39%	
85 VF CORP	\$48.82	\$1.28	13.30	16.39%	
86 TRIBUNE CO	\$80.40	\$1.04	14.30	16.36%	
87 COMPUTER ASSOCIATES INTL INC	\$34.25	\$0.14	15.60	16.30%	
88 TANDY CORP	\$36.63	\$0.60	14.30	16.28%	
89 AVON PRODUCTS	\$57.82	\$1.80	12.50	16.23%	
90 WALGREEN CO	\$41.25	\$0.69	13.00	14.97%	
91 RUBBERMAID INC	\$26.92	\$0.45	14.20	16.22%	
92 DRESSER INDUSTRIES INC	\$22.52	\$0.68	12.80	16.22%	
93 COOPER TIRE & RUBBER	\$26.21	\$0.22	15.20	16.22%	
94 GENERAL MILLS INC	\$53.90	\$1.88	12.00	16.20%	
95 DUN & BRADSTREET CORP	\$58.52	\$2.80	10.80	16.18%	
96 GREAT ATLANTIC & PAC TEA CO	\$24.75	\$0.80	12.30	16.17%	
97 KERR-MCGEE CORP	\$44.15	\$1.82	12.00	16.11%	
98 GREAT LAKES CHEMICAL CORP	\$65.73	\$0.39	15.40	16.10%	
99 INTL FLAVORS & FRAGRANCES	\$35.75	\$1.08	12.50	16.02%	
100 WESTVACO CORP	\$31.88	\$1.10	11.60	16.02%	
101 TYCO INTL INC	\$48.54	\$0.40	15.00	16.00%	
102 JOHNSON CONTROLS INC	\$40.06	\$1.44	11.70	15.89%	
103 BEAUS CO	\$22.58	\$0.54	13.10	15.97%	
104 MCI COMMUNICATIONS	\$23.76	\$0.05	15.70	15.96%	
105 CAMPBELL SOUP CO	\$39.21	\$1.12	12.50	15.92%	
106 AVERY DENNISON CORP	\$28.30	\$0.96	11.90	15.92%	
107 SEARS ROEBUCK & CO	\$46.71	\$1.80	11.60	15.89%	
108 AMERICAN CYANAMID CO	\$47.32	\$1.85	11.20	15.83%	
109 WORTHINGTON INDUSTRIES	\$19.44	\$0.40	13.20	15.67%	
110 DAYTON HUDSON CORP	\$75.77	\$1.68	13.00	15.66%	
111 KAUFMAN & BROAD HOME	\$19.63	\$0.30	13.80	15.64%	
112 SARA LEE CORP	\$21.65	\$0.64	12.10	15.63%	
113 THOMAS & BETTS CORP	\$62.88	\$2.24	11.40	15.63%	
114 FREMARK INTERNATIONAL INC	\$74.71	\$1.12	13.60	15.61%	
115 DON JONES & CO INC	\$38.77	\$0.84	13.00	15.60%	
116 WRIGLEY (WAM) JR CO	\$50.08	\$0.83	13.00	15.56%	
117 FEDERAL PAPER BOARD CO	\$22.88	\$1.00	10.40	15.57%	
118 MCKESSON CORP	\$67.33	\$1.68	12.50	15.48%	
119 MERRICK & CO	\$30.40	\$1.12	11.10	15.47%	
120 DELUXE CORP	\$29.56	\$1.44	9.70	15.43%	
121 INTERPUBLIC GROUP OF COS	\$30.27	\$0.66	13.20	15.42%	
122 FROCTER & GAMBLE CO	\$54.75	\$1.24	12.70	15.41%	
123 K MART CORP	\$17.15	\$0.98	8.80	15.39%	
124 ECOLAB INC	\$21.92	\$0.44	12.80	15.35%	
125 MAY DEPARTMENT STORES CO	\$41.17	\$1.04	12.30	15.32%	
126 WEYERHAEUSER CO	\$43.15	\$1.20	12.00	15.32%	
127 MASCO CORP	\$30.85	\$0.69	12.80	15.25%	
128 HEWLETT-PACKARD CO	\$60.98	\$1.00	13.70	15.19%	
129 TENNECO INC	\$51.83	\$1.60	11.50	15.18%	
130 ROYAL DUTCH PET -NY REG	\$105.05	\$4.89	9.90	15.18%	
131 BROWN-FORMAN -CL B	\$29.15	\$0.95	11.30	15.16%	
132 HILTON HOTELS CORP	\$68.85	\$1.20	12.70	15.14%	
133 SHARED MEDICAL SYSTEMS CORP	\$26.17	\$0.84	11.30	15.11%	
134 MELVILLE CORP	\$39.02	\$1.32	10.50	15.10%	
135 DILLARD DEPT STORES -CL A	\$33.73	\$0.08	14.80	15.09%	
136 SNAP-ON INC	\$32.10	\$1.08	11.80	15.08%	
137 COOPER INDUSTRIES INC	\$37.38	\$1.32	10.80	15.08%	
138 MONSANTO CO	\$78.18	\$2.32	11.30	15.08%	
139 PPG INDUSTRIES INC	\$74.82	\$2.24	11.50	15.07%	
140 GIANT FOOD INC -CL A	\$22.88	\$0.72	11.30	15.02%	
141 PIONEER H-BRED INTERNATIONAL	\$35.04	\$0.56	13.10	15.01%	
142 NALCO CHEMICAL CO	\$33.85	\$0.98	11.60	14.99%	
143 GIDDINGS & LEWIS INOMI	\$24.80	\$0.12	14.40	14.99%	
144 AMP INC	\$62.75	\$1.68	11.60	14.98%	
145 ECHLIN INC	\$27.77	\$0.76	11.70	14.95%	
146 SUPERVALU INC	\$33.38	\$0.88	11.80	14.94%	
147 PRAXAIR INC	\$18.48	\$0.28	13.10	14.91%	
148 GENERAL ELECTRIC CO	\$48.08	\$1.44	11.40	14.89%	
149 AMERICAN GREETINGS -CL A	\$28.23	\$0.50	12.70	14.82%	
150 POTLATCH CORP	\$41.71	\$1.56	10.40	14.81%	
151 CYPRIUS AMAX MINERALS CO	\$28.77	\$0.80	11.50	14.80%	
152 AMERICAN BRANDS INC/DIE	\$31.98	\$2.00	7.90	14.78%	
153 PITNEY BOWES INC	\$40.98	\$1.04	11.70	14.75%	
154 CLOROX CO/DE	\$50.17	\$1.80	10.50	14.73%	
155 JOHNSON & JOHNSON	\$52.46	\$1.16	12.10	14.73%	
156 AUTOMATIC DATA PROCESSING	\$51.48	\$0.52	13.80	14.71%	
157 GOODYEAR TIRE & RUBBER CO	\$40.28	\$0.80	12.30	14.67%	
158 CONAGRA INC	\$27.88	\$0.72	11.80	14.65%	
159 REEBOK INTERNATIONAL LTD	\$31.65	\$0.30	13.30	14.64%	
160 RTE AID CORP	\$18.08	\$0.60	10.80	14.62%	
161 EASTMAN KODAK CO	\$43.67	\$1.80	10.30	14.62%	
162 MCGRAW-HILL INC	\$66.88	\$2.32	10.50	14.60%	
163 NORDSTROM INC	\$41.88	\$0.40	13.40	14.54%	
					3rd Quartile
					Mean
					Median
					Mid-Val Mean

15.65%
15.61%
15.44%

Company	Price	Divid	IBES Mean Growth	DCF Qty Result
164 CPC INTERNATIONAL INC	\$47.10	\$1.36	11.10	14.52%
165 AMOCO CORP	\$54.68	\$2.20	9.80	14.50%
166 HARLAND (JOHN H.) CO	\$22.96	\$0.98	9.40	14.48%
167 MCDONALDS CORP	\$98.60	\$0.43	13.60	14.48%
168 DEERE & CO	\$79.96	\$2.00	11.50	14.48%
169 HARRIS CORP	\$45.60	\$1.12	11.50	14.41%
170 KELLOGG CO	\$50.23	\$1.36	11.20	14.40%
171 KIMBERLY-CLARK CORP	\$54.67	\$1.76	10.80	14.40%
172 SUN INC	\$32.25	\$1.80	7.90	14.38%
173 CHEVRON CORP	\$67.54	\$3.70	9.40	14.35%
174 AMERICAN STORES CO-NEW	\$25.41	\$0.48	12.10	14.35%
175 PHELPS DODGE CORP	\$35.00	\$1.65	10.80	14.34%
176 FULTON CORP	\$27.85	\$0.24	13.30	14.33%
177 WHITMAN CORP	\$15.50	\$0.30	12.00	14.30%
178 AIR PRODUCTS & CHEMICALS INC	\$44.00	\$0.92	11.80	14.28%
179 WARNER-LAMBERT CO	\$85.42	\$2.44	9.80	14.28%
180 BRISTOL MYERS SQUIBB	\$53.17	\$2.92	7.90	14.27%
181 BAXTER INTERNATIONAL INC	\$23.31	\$1.00	9.20	14.21%
182 MILLIPORE CORP	\$47.38	\$0.56	12.80	14.21%
183 CENTEX CORP	\$30.04	\$0.20	13.40	14.20%
184 APPLE COMPUTER INC	\$32.25	\$0.48	12.40	14.17%
185 HEINZ (H.J.) CO	\$33.10	\$1.32	9.50	14.17%
186 GANNETT CO	\$82.81	\$1.32	11.20	14.15%
187 UNILEVER N.V. -NY SHARES	\$107.19	\$3.05	10.80	14.15%
188 ILLINOIS TOOL WORKS	\$41.00	\$0.52	12.80	14.11%
189 TEXACO INC	\$64.04	\$3.20	8.30	14.11%
190 PARKER-HANNIFIN CORP	\$38.56	\$1.00	11.10	14.08%
191 SHERMAN-WILLIAMS CO	\$31.92	\$0.56	12.00	14.08%
192 QUAKER OATS CO	\$84.21	\$2.12	10.20	14.08%
193 HASBRO INC	\$34.48	\$0.28	13.10	14.07%
194 FENNEY (J.C.) CO	\$53.98	\$1.68	10.40	14.05%
195 KNIGHT-RIDDER INC	\$58.13	\$1.40	11.20	14.05%
196 LIZ CLAIRBORNE INC	\$23.79	\$0.46	11.80	14.04%
197 HERCULES INC	\$108.05	\$2.24	11.80	14.03%
198 DONNELLEY (R.R.) & SONS CO	\$28.46	\$0.56	11.70	14.03%
199 MINNESOTA MINING & MFG CO	\$50.19	\$1.78	8.80	14.01%
200 GRAINGER (MW) INC	\$53.23	\$0.60	12.50	14.01%
201 CATERPILLAR INC	\$111.10	\$0.60	13.30	13.95%
202 HERSHEY FOODS CORP	\$45.63	\$1.20	10.80	13.90%
203 XEROX CORP	\$68.71	\$3.00	10.30	13.87%
204 ST JUDE MEDICAL INC	\$25.96	\$0.40	12.10	13.86%
205 SPRINGS INDUSTRIES -CL A	\$33.98	\$1.20	9.70	13.84%
206 AMERICAN HOME PRODUCTS CORP	\$58.35	\$2.92	8.00	13.80%
207 WINN-DIXIE STORES INC	\$50.38	\$1.44	10.40	13.78%
208 CBS INC	\$293.29	\$2.00	12.80	13.71%
209 INGERSOLL-RAND CO	\$35.94	\$0.70	11.40	13.70%
210 LOUISIANA-PACIFIC CORP	\$35.42	\$0.50	12.00	13.67%
211 HANDLEMAN CO	\$11.00	\$0.44	9.00	13.65%
212 ANHEUSER-BUSCH COS INC	\$52.44	\$1.44	10.40	13.63%
213 MEAD CORP	\$42.21	\$1.00	10.80	13.63%
214 DIAL CORP/DE	\$44.40	\$1.20	10.40	13.57%
215 FACCAR INC	\$52.48	\$1.87	9.40	13.55%
216 NEWMONT MINING CORP	\$42.08	\$0.48	12.20	13.55%
217 AT&T CORP	\$52.63	\$1.32	10.80	13.55%
218 GRACE (M.R.) & CO	\$41.67	\$1.40	9.80	13.53%
219 NIKE INC -CL B	\$55.79	\$0.80	11.80	13.50%
220 EMERSON ELECTRIC CO	\$88.73	\$1.58	10.40	13.47%
221 HONEYWELL INC	\$32.75	\$0.66	10.00	13.43%
222 GENUINE PARTS CO	\$35.23	\$1.15	9.80	13.41%
223 TIME WARNER INC	\$38.36	\$0.36	12.30	13.41%
224 FLEMING COMPANIES INC	\$24.60	\$1.20	7.80	13.37%
225 LUBYS CAFETERIAS INC	\$23.71	\$0.60	10.40	13.37%
226 UNITED TECHNOLOGIES CORP	\$64.58	\$1.80	10.10	13.37%
227 CAPITAL CITIES/ABC INC	\$703.38	\$0.20	13.30	13.33%
228 EXXON CORP	\$82.52	\$2.68	8.00	13.33%
229 ALLIEDSIGNAL INC	\$35.81	\$0.67	11.10	13.30%
230 POLAROID CORP	\$31.32	\$0.60	11.00	13.24%
231 WHIRLPOOL CORP	\$58.31	\$1.22	10.80	13.22%
232 MOBIL CORP	\$78.00	\$3.40	8.10	13.18%
233 BRUNOS INC	\$7.77	\$0.24	9.50	13.10%
234 STANLEY WORKS	\$38.23	\$1.36	9.00	13.03%
235 GENERAL SIGNAL CORP	\$32.84	\$0.90	9.80	12.98%
236 NATIONAL SERVICE INDS INC	\$26.23	\$1.08	8.20	12.87%
237 TRINOMA CORP	\$35.80	\$0.68	10.70	12.85%
238 CINCINNATI MILACRON INC	\$21.82	\$0.36	11.00	12.83%
239 TIMPULUH-LAND INC	\$47.95	\$1.00	10.40	12.83%
240 DOVER CORP	\$68.38	\$0.92	11.00	12.83%
241 ROHM & HAAS CO	\$57.44	\$1.40	10.00	12.85%
242 EATON CORP	\$35.73	\$1.20	10.30	12.82%
243 DU PONT (E.I.) DE NEMOURS	\$65.77	\$1.78	9.20	12.81%
244 TRW INC	\$57.40	\$1.88	9.50	12.75%
245 PET INC	\$17.73	\$0.32	10.80	12.72%

2nd Quartile
Mean 14.11%
Median 14.11%
Mkt Wtd Mean 14.11%

Company	Price	Divid	IBES Mean Growth	DCF Qty Result	
246 JAMES RIVER CORP OF VIRGINIA	\$17.46	\$0.80	8.70	12.89%	
247 ITT CORP	\$87.02	\$1.98	10.00	12.89%	
248 TEKTRONIX INC	\$28.98	\$0.80	10.30	12.84%	
249 DANA CORP	\$58.23	\$1.88	9.10	12.57%	
250 SEAGRAM CO LTD	\$28.92	\$0.98	10.30	12.57%	
251 SPECTON DICKINSON & CO	\$37.92	\$0.74	10.20	12.48%	
252 BOEING CO	\$45.21	\$1.00	9.90	12.48%	
253 MERCANTILE STORES CO INC	\$37.77	\$1.02	9.90	12.44%	
254 TEXTRON INC	\$54.21	\$1.40	9.40	12.40%	
255 ALBERTO-CULVER CO -CL B	\$21.31	\$0.28	10.80	12.34%	
256 COORS (ADOLPH) -CL B	\$18.71	\$0.30	9.20	12.30%	
257 UNION CARBIDE CORP	\$25.18	\$0.75	8.80	12.25%	
258 SYNTEX CORP	\$17.35	\$1.04	5.30	12.10%	
259 E-SYSTEMS INC	\$42.40	\$1.20	8.80	12.08%	
260 EASTMAN CHEMICAL CO	\$43.15	\$1.80	7.80	12.07%	
261 GEORGIA-PACIFIC CORP	\$83.13	\$1.80	9.10	12.04%	
262 LILLY (ELI) & CO	\$51.75	\$2.30	6.90	12.02%	
263 GIBBER PRODUCTS CO	\$34.15	\$0.88	9.00	11.82%	
264 RALSTON PURINA GROUP	\$38.83	\$1.20	8.30	11.87%	
265 HARNISCHFEEGER INDUSTRIES INC	\$21.92	\$0.40	9.70	11.88%	
266 SPX CORP	\$15.58	\$0.40	8.80	11.77%	
267 ALUMINUM CO OF AMERICA	\$71.10	\$1.80	9.10	11.71%	
268 FORD MOTOR CO	\$59.35	\$1.80	8.20	11.70%	
269 ARCHER-DANIELS-MIDLAND CO	\$23.83	\$0.10	11.20	11.68%	
270 PLACER DOME INC	\$22.46	\$0.28	10.30	11.65%	
271 BALL CORP	\$28.85	\$0.80	9.00	11.81%	
272 ROCKWELL INTL CORP	\$38.73	\$1.00	8.80	11.58%	
273 NORTHERN TELECOM LTD	\$28.29	\$0.36	10.00	11.43%	
274 REYNOLDS METALS CO	\$46.13	\$1.00	8.80	11.41%	
275 LORAL CORP	\$37.67	\$0.58	9.80	11.33%	
276 SCOTT PAPER CO	\$43.08	\$0.80	9.10	11.25%	
277 GENERAL DYNAMICS CORP	\$42.28	\$2.40	4.80	11.20%	
278 CUMMINS ENGINE	\$46.10	\$0.30	9.90	11.18%	
279 ARMSTRONG WORLD INDUS INC	\$53.46	\$1.28	8.40	11.18%	
280 WESTINGHOUSE ELECTRIC CORP	\$12.28	\$0.20	9.20	11.08%	
281 INTL BUSINESS MACHINES CORP	\$58.92	\$1.00	9.00	11.03%	
282 CHRYSLER CORP	\$50.79	\$0.80	9.20	11.02%	
283 ALLERGAN INC	\$21.92	\$0.40	8.70	10.80%	
284 LONGS DRUG STORES INC	\$33.88	\$1.12	7.00	10.78%	
285 RAYTHEON CO	\$53.86	\$1.40	8.20	10.71%	
286 UPJOHN CO	\$28.46	\$1.48	4.80	10.65%	
287 MAYTAG CORP	\$18.58	\$0.50	7.30	10.37%	
288 LOCKHEED CORP	\$82.81	\$2.28	6.20	10.32%	
289 USX & STEEL GROUP	\$35.96	\$1.00	7.00	10.20%	
290 MCCONNELL DOUGLAS CORP	\$113.88	\$1.40	8.70	10.11%	
291 INCO LTD	\$24.42	\$0.40	8.10	9.98%	
292 BORDEN INC	\$13.38	\$0.30	7.20	9.75%	
293 MARTIN MARIETTA CORP	\$45.94	\$0.90	7.20	9.53%	
294 GENERAL MOTORS CORP	\$58.27	\$0.80	7.70	9.32%	
295 NORTHROP GRUMMAN CORP	\$38.15	\$1.80	4.70	9.28%	
296 HOMESTAKE MINING	\$20.06	\$0.20	8.00	9.14%	
297 BOISE CASCADE CORP	\$22.58	\$0.60	5.80	8.90%	
298 ALCAN ALUMINUM LTD	\$22.28	\$0.30	6.80	8.42%	
299 ASARCO INC	\$24.17	\$0.40	8.10	7.95%	
300 CHAMPION INTERNATIONAL CORP	\$30.05	\$0.20	5.40	6.14%	
					1st Quartile
					Mean
					Median
					Mkt Vld Mean

Notes:

- * Quarterly DCF Model with 5% Flotation
- * 3-month average price - March, April and May 1994
- * 78 were removed due to lack of information (i.e. no dividends, lack of IBES estimates, etc.)

CABLE COMPANY CAPITAL STRUCTURES

<u>Company Name</u>	<u>Ticker</u>	(a) Common Equity 1993	(b) Retained Earnings 1993	(c) CEQ - Ret. Earn. 1993	(d) Total Debt 1993	(e) Debt Ratio 1993
Adelphia Commun -CL A	ADLAC	(\$868.614)	(\$928.879)	\$60.265	\$1,731.099	96.64%
Cablevision Systems -CL A	CVC	(\$1,503.201)	(\$1,419.900)	(\$83.301)	\$2,235.499	103.87%
Century Commun -CL A	CTY	(\$215.238)	(\$280.499)	\$65.261	\$1,187.495	94.79%
Comcast Corp -CL A SPL	CMCSK	(\$870.531)	(\$1,739.400)	\$868.869	\$4,427.695	83.60%
Jones Intercable Inc. -CL A	JOINA	\$31.649	(\$88.193)	\$119.842	\$327.214	73.19%
Jones Spacelink LTD -CL A	SPLKA	\$6.988	(\$38.520)	\$45.508	\$396.479	89.70%
TCA Cable TV Inc.	TCAT	\$90.251	\$46.024	\$44.227	\$143.253	76.41%
Tele-Communications -CL A	TCOMA	\$2,112.000	(\$377.000)	\$2,489.000	\$9,900.000	79.91%
TOTAL		(\$1,216.70)	(\$4,826.37)	\$3,609.67	\$20,348.73	84.93%

Notes:

All data from S&P Compustat
All data on calendar year basis
c = a - b
e = d/(c+d)

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C.**

In the matter of)	
)	
Implementation of Sections of the Cable)	MM Docket No. 93-215
Television Consumer Protection and)	
Competition Act of 1992: Rate Regulation)	
)	
and)	
)	
Adoption of a Uniform Accounting System)	CS Docket No. 94-28
for Provision of Regulated Cable Service)	

**DECLARATION OF ROBERT G. HARRIS
IN SUPPORT OF REPLY COMMENTS OF BELL ATLANTIC**

A. Qualifications and Purpose of Declaration

1. My name is Robert G. Harris. I am an Associate Professor in the Walter A. Haas School of Business, University of California, Berkeley, and Principal in the Law & Economics Consulting Group. I have presented testimony in this proceeding on the importance of adopting comparable or corresponding regulatory policies toward the cable and local exchange telephone industries as competition between those industries increases. In my earlier testimony, I explained why the Commission should adopt the same conceptual standard for the productivity offset in the cable and LEC price cap plans. In both cases, it is appropriate that future price increases be limited to inflation less a productivity offset, where the offset is set to equal the difference between industry-specific productivity growth and the average growth in productivity for the U.S. economy.

2. This declaration will comment on the use of estimates of total factor productivity (TFP) growth by Christensen Associates (Attachment B to comments of the National Cable Television Association) in setting a productivity offset for the price cap on cable rates. In Section B, I will compare the Christensen study of TFP growth for local exchange carriers, which was based on highly detailed data covering nearly the entire industry, with the Christensen cable industry TFP study, which was based on a very limited set of data. I will explain the nature and effects of the data limitations on the Christensen estimates, and why those results should be adjusted to correct for the data limitations. In Section C., I will explain how the Christensen cable and LEC TFP results should be adjusted to make them comparable. I will show that, if the LEC TFP estimates were based on an output measure comparable to that employed in the cable TFP study, the resulting LEC productivity offset would fall from 1.7% to -.2%. Alternatively, I will show that, if the cable output measure were comparable to the one used in the LEC TFP study, measured cable TFP would increase from -1.9% to +4.4%. Both of these results provide empirical support for my position that the Commission should adopt a productivity offset in cable price caps that is no less than that adopted for the LEC price cap plan.

3. Section D. will respond to the argument of Economists Incorporated that the dramatic increases in cable rates during the 1980's supports the cable industry's argument that there should be no productivity offset in the cable price cap. That argument is based on flawed reasoning and would essentially reward cable companies with higher rates in the future, on the basis of their having raised rates much faster than inflation in the past. The whole point of the Cable Act of 1992 was to prevent cable companies from continuing to raise their prices as they did between 1984 and 1992. Section E is a brief summary of my opinions and recommendations.

B. The Data Limitations in the Cable TFP Study Bias the Estimates of Cable Productivity Growth Downward

4. Christensen Associates presented its study of historical TFP growth for local exchange carriers in the Commission's LEC price cap review.¹ Christensen estimated historic TFP growth for LECs at 2.6%, which generates a productivity offset of 1.7% for LEC price caps.² While Christensen Associates used a similar methodology for estimating TFP growth in the cable industry, there are substantial differences in the two studies. These differences, in sample size, sample bias and measures of output, mean that the results of the two studies are not directly comparable.³

5. The Christensen LEC TFP study used data from all seven Regional Bell Holding Companies, GTE and Southern New England Telephone, comprising roughly 93% of all LEC access lines. In contrast, the cable study was based on a data request

“sent to nine Multiple System Operators...which serve approximately one-half of all cable television subscribers in the United States...Three MSOs, serving 3.7 million subscribers, were able to send us the necessary data. These 3.7 million subscribers represent approximately six percent of all U.S. cable subscribers. Two of the MSOs were able to provide data for the full 1984-1993 period; the third MSO was able to provide data for 1988-1993.” (Christensen Cable TFP Study, p. 3).

¹ Price Cap Performance Review of Local Exchange Carriers, CC Docket No. 94-1, Comments of the United States Telephone Association. Attachment 6, “Productivity of Local Telephone Operating Companies.” (Filed May 9, 1994).

² The appropriate productivity offset in a price cap plan is the difference between the industry-specific TFP and the TFP for the economy as a whole. Since LEC TFP was estimated at 2.6% and the average TFP for the U.S. economy at .9%, the resulting LEC productivity offset would be 1.7%.

³ Christensen readily acknowledges these differences: “While the methodology is the same as that used in the telephone industry TFP studies, its application differs to some degree, due to data limitations.” Christensen Associates, “Productivity Growth in the Cable Television Industry,” June 1994, page 4.

The results of a TFP study covering 6% of the industry are not comparable to results from a study covering 93%. This must mean that the sample excludes the largest MSOs, TeleCommunications, Inc. and Time-Warner, each of which has more than six percent of all cable subscribers.⁴ This would be equivalent to the LECs presenting a productivity study that excluded the seven RBOCs and GTE and included only three small, independent LECs. Were the LECs to present a productivity study based on the historical performance of Centel, United Telephone and Alltel, for example,⁵ the FCC would presumably reject the results of that study as inadequate and not indicative of TFP growth in the industry. There are several problems with basing industry-level policy conclusions on historical TFP measured from so small a subset of the industry.

6. First, there is no way to know whether the three responding MSOs experienced more or less rapid TFP growth than other cable firms. I would note, though, that the responding firms are not a random sample of cable operators. Given the nature of the data solicitation process, there could well have been a "self-selection bias," since each firm decided whether or not it would respond to the data request. If the cable operators who have experienced the highest rates of productivity growth chose not report their data to Christensen Associates, the TFP study is based on a biased sample. It is especially troubling that neither of the largest MSOs, TCI or Time-Warner, is included in the sample. If TFP growth were faster for large MSOs than for

⁴ TCI has 11.3 million subscribers, Time-Warner has 6.7 million subscribers. Since the total number of subscribers in the sample is only 3.7million, neither is included in the sample. See Television Digest, May 23, 1994, p. 4.

⁵ According to the USTA's 1993 Statistics of the Local Exchange Carriers for 1992, the total number of access lines for United Telecom, CENTEL and ALLTEL was approximately 7.1 million access lines or about 5% of the 144.1 million total network access lines in the US.

small MSOs, the Christensen Associates' results would not be representative of the industry. The magnitude of this potential source of bias is quite large. For example, if average input growth for larger MSOs were half the rate of the three MSOs in the study sample, TFP growth for the industry would be about +0.9%, versus the -1.9% reported by Christensen.⁶ There is little or no such bias in the LEC TFP study, in contrast, because it was based on the largest U.S. local exchange carriers, comprising 93% of all access lines.⁷

7. Second, because of the small number of firms in the sample, the timing of expenditures and of growth in output is unlikely to be typical of the industry. In the Christensen sample of three MSOs, output and input growth fall from their 1985 rate, rising again in 1988-89. Measured TFP growth falls from 12% to -23% between 1988 and 1989.⁸ This period coincides with the addition of data from a third MSO into the sample, which suggests that the reduction in measured TFP is probably not applicable to the cable industry as a whole. Furthermore, in capital-intensive, network-based services like cable and telephone, productivity growth is likely to differ among firms depending on whether the system is under construction and expanding

⁶ Using 1994 subscribership data, about 54 percent of subscribers are served by an MSO having more subscribers than the average of the three MSOs participating in the Cable TFP study: $(3.7/3 = 1.23 \text{ million})$. See Cablevision, June 6, 1994, p. 53. TFP growth for this sample would be 3.3 percent $(8.5 - (10.3/2)\text{average output growth minus one-half average input growth})$. A weighted average of the large and small MSOs' TFP growths is then 0.9 percent.

⁷ Significantly faster or slower TFP growth for the small telephone companies not covered in the LEC TFP study would not lead to a large bias: if the input growth rate for the small telephone companies omitted from the LEC TFP study were twice the growth rate of those in study, measured LEC TFP would fall from 2.6% to 2.5%, and the corresponding LEC productivity offset would drop from 1.7% to 1.6%. This adjustment was calculated as follows: input growth for the telephone companies in the TFP study was approximately 0.94% annually, output growth was 3.55% per year. Total Factor Productivity growth was 2.59% for 93% of access lines. The seven percent not included in the TFP study would have, by assumption, 1.86% annual growth in inputs and 1.67% TFP growth $(3.55 - (0.94 \times 2))$. Weighted TFP growth would then be 2.53% for the entire industry.

⁸ Appendix 1 of the Christensen Cable TFP study.

or whether it has reached maturity. In building out a network, the firm incurs high initial increases in inputs because of large expenditures on fixed plant. If accounting followed economic theory, this growth in inputs would be capitalized and spread over the economic life of the assets constructed. However, the high growth of input quantities during the 1985 and 1989 periods suggests that the three particular firms in the sample were undertaking significant construction. Similarly, output growth peaks in 1985-86 and 1988, which is again consistent with the hypothesis that two firms built out their networks in 1985-86 and the third in 1988. Hence, it is highly unlikely that these three firms are typical of the U.S. cable industry.

C. Adjusting the Cable and LEC TFP Estimates for Comparable Measures of Output and Quality Changes

8. There are two different approaches to measuring output for multi-product firms: (a) physical measures of output growth (subscribers, channels, minutes of use, etc.) weighted together using service revenues as weights, and (b) an index of the quantity of output obtained by subtracting the growth of prices from the growth of revenue for each service and averaging the results, using service revenues as weights. Historical productivity growth estimates using these different approaches to measuring output growth are not likely to be comparable. In addition, both methods of measuring output assume that all relevant aspects of the service are captured either in the physical measurements used or in the revenue and price indices.

9. The Christensen cable TFP study measures industry output as a revenue-weighted average of the number of basic and premium subscribers. In contrast, the Christensen LEC TFP study measures output as revenue from each of the telecommunications services supplied by LECs, deflated to remove the effects of

price changes. Christensen explains his use of “number of subscribers” as the sole measure of cable output as due to data limitations. Estimating TFP growth using the number of subscribers as the sole measure of output omits at least three other significant cable industry outputs that have increased over the period: (a) the number of channels in basic tier and first tier services; (b) overall viewership (as measured in ratings, for example); and (c) advertising. Consider the increase in the number of basic tier channels: in the cable TFP study, the costs of the increase in channels are effectively measured as reductions in productivity. In order to attract the same number of subscribers, all else equal, the cable company would have to use more inputs. The fact that customers valued the additional channels, paid more (and were willing to pay more) for the additional channels is omitted from this measure of the output of a cable system. This represents a significant downward bias in the estimation of TFP.

10. While producing a comparable TFP study for LECs and Cable companies would be difficult because of data limitations, it is straightforward to obtain an estimate of the magnitude of the difference that these two approaches to measuring output can make. First, one can adjust the LEC productivity estimate by using a comparable measure of output to the one used in the cable TFP study. Suppose that the output of LECs were measured by numbers of subscribers. During the 1984-92 period, residential telephone subscribership increased from 79.9 million to 91.0 million households, achieving an annual rate of growth of 1.64%. During approximately the same period, the number of business establishments increased from 5.3 to 7.5 million at an annual rate of growth of 1.61%. In the LEC TFP study, output growth averaged 3.55% per year from 1984-93. Using 1.6% as the annual rate of growth of LEC output would reduce TFP growth in the LEC TFP study from 2.6% per year to

0.7%, with a corresponding reduction in the LEC productivity offset to -.2%. Thus, if one uses a measure of LEC output that is comparable to that used in the cable TFP study, one would conclude that there should be no productivity offset in the price caps of either industry.

11. A second method of making the cable and LEC TFP results comparable is by adjusting the cable results to reflect measures of output that are more comparable to the output measures used in the LEC TFP study. A physical measure of the output of a cable system takes into account the number of subscribers and the qualities of the output to which they subscribe, because the number of subscribers does not, by itself, capture all of the output of a cable company. A system that provides 24 channels in its basic service tier and has 100 subscribers produces more output than another system that also has 100 subscribers but only provides 12 channels in its basic tier. Output for the first system exceeds output for the second because it has twice the number of channels; customers would be willing to pay more for subscribing to the first system. If all channels were equally valued by subscribers, this difference could be accounted for by measuring output as the product of subscribers and channels (subscriber-channels). The average number of active channels grew 8.7% per year, from 29 in 1984 to 56 in 1992.⁹ Subscriber-channels thus grew at an annual rate of 14.7% from 1984 through 1992. If the measure of output in the Cable TFP study were adjusted to account for the change in the average number of channels, estimated TFP growth for the cable industry would

⁹ The 1984 estimate is from Federal Communications Commission, Report, MM Docket No. 89-600, July 31, 1990, Appendix F, p. 23. The 1992 figure is estimated from data in Cablevision, May 4, 1992 at 20, by taking a weighted average of the midpoints of the reported ranges of channel capacity per system.

increase from -1.9% to +4.4%.¹⁰ After subtracting economy-wide TFP of approximately .9% during that period, that would suggest a cable price cap productivity offset of 3.5%, compared to a 1.7% productivity offset for LECs. Such a result is not only far more comparable than a superficial reading of the two Christensen studies would indicate, it is also consistent with my expectation that the cable productivity offset should, if anything, be higher than the LEC productivity offset.

D. Dramatic Cable Rate Increases in the 1980's Do Not Support a Zero Productivity Offset in Cable Price Caps for the 1990's

12. In their Attachment C to the Comments of the National Cable Television Association in this proceeding, Economists Incorporated acknowledge that there was a substantial increase in the number of cable channels and quantity of cable programming available to subscribers during the period for which Christensen measured TFP growth for three cable MSOs. This evidence supports my view that the use of subscribers as an output measure strongly biases the estimate of cable productivity growth downward.

13. Economists Incorporated also argue, though, that "the price increases for all forms of competitive franchises were likely the result of improved quality of

¹⁰ In 1984, there were an average 29.0 channels and 37.3 million subscribers for a total of 1081.7 subscriber-channels. In 1993, there were approximately 56.5 channels per system and 57.2 million subscribers for a total of 3231.8 million subscriber-channels. Using subscriber channels as a measure of output translates into an annual output growth rate of 14.7%. Input growth was estimated by the Cable TFP study at 10.33%. Thus TFP growth increases from -1.9% to 4.4% (14.7 - 10.33).